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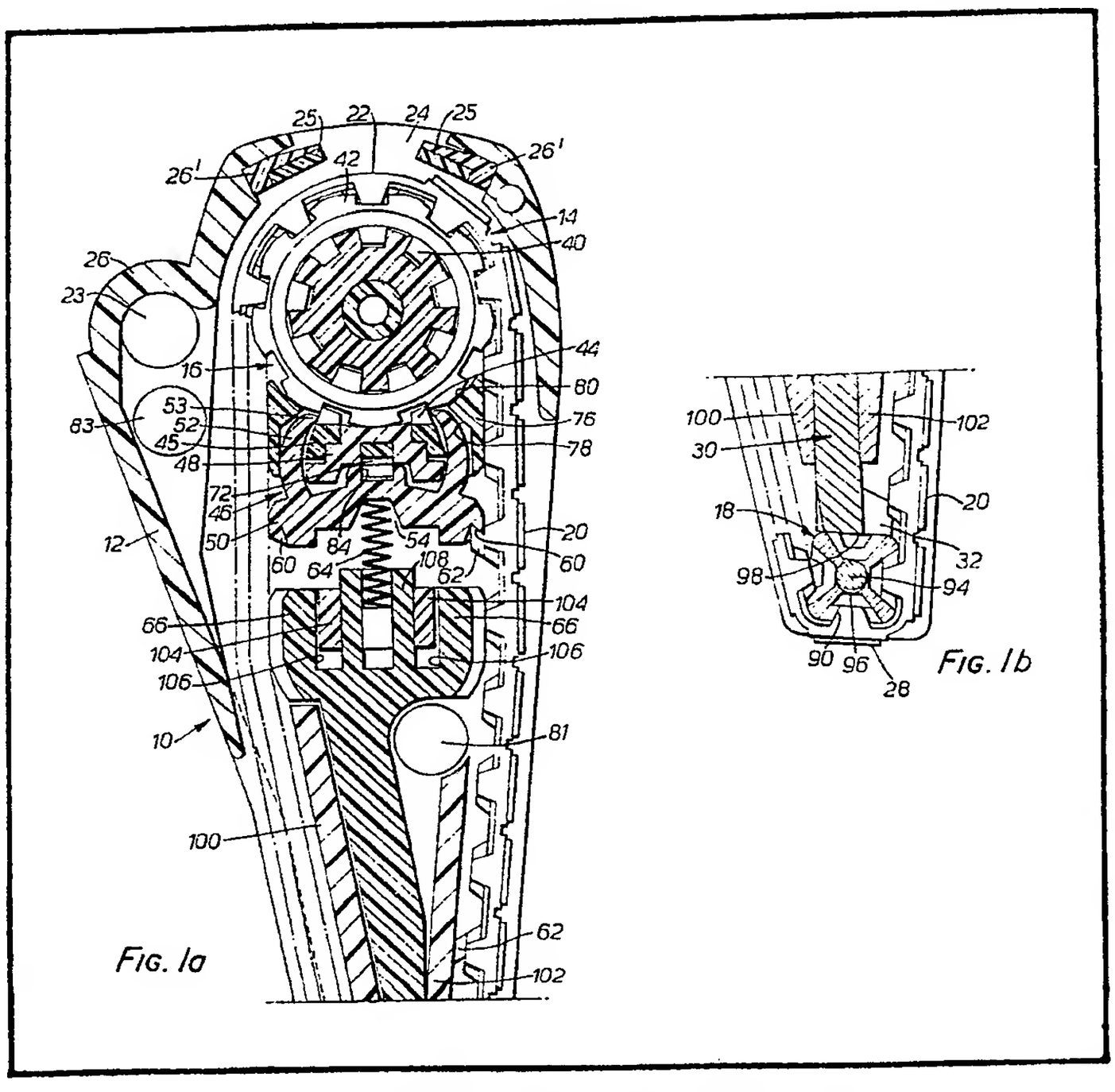
(54) Adjustable Facet Print Heads

(57) An adjustable facet print head includes a plurality of print bands each made of a relatively hard base material and a relatively soft material forming the print facets. The bands each have read-out facets (22) as well as print facets (20) and stop pips (62) to prevent movement of the print facets into the zone normally occupied by the read-out facets. The bands are mounted on individual support wheels (16, 18) and the wheels (18) are shaped to give accurate, but resilient support for the print facets operative at any given setting.

A knob serves both to select a band to be adjusted by longitudinal motion relative to the row of bands and rotary motion to select the required facet of the selected band. The knob also serves to adjust an indicator for indicating the band selected for adjustment.



The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.

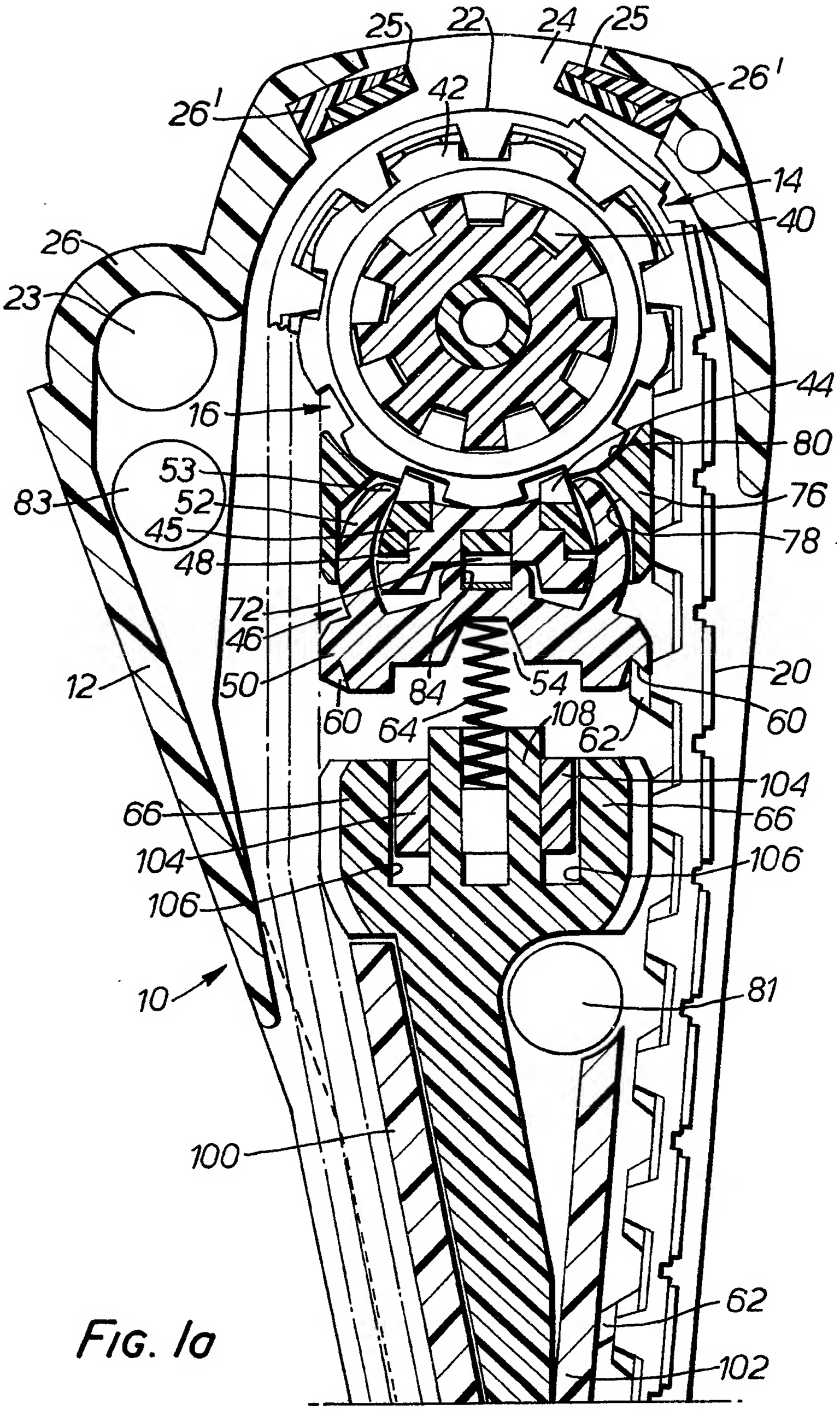

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FIG. 1a

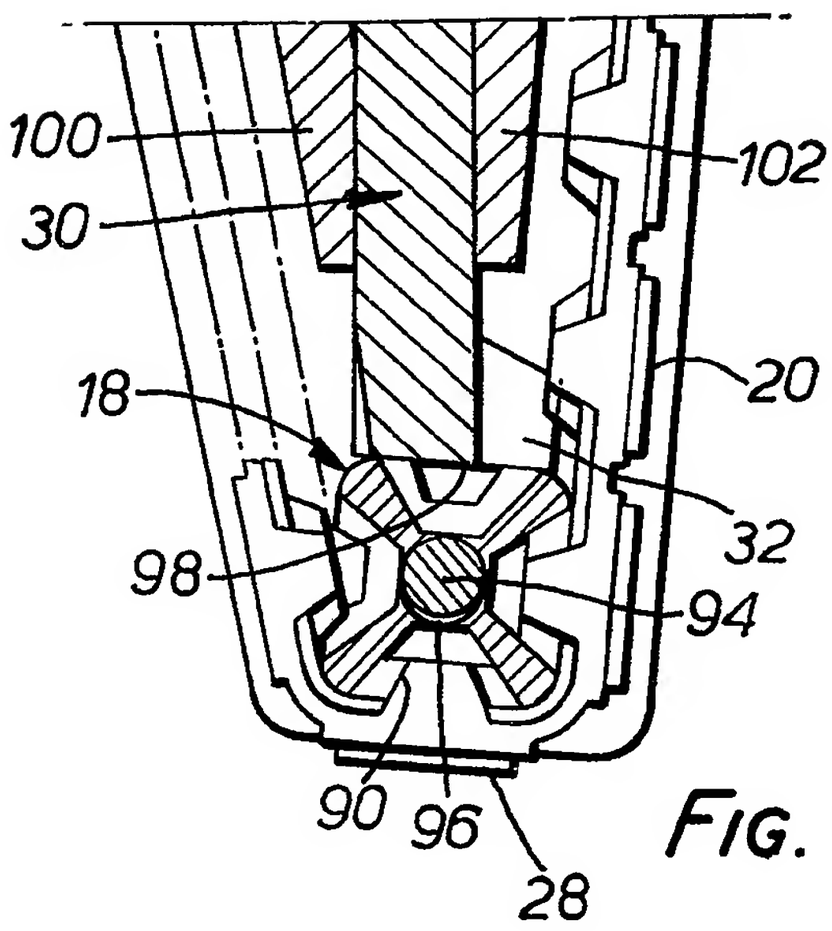


FIG. 1b

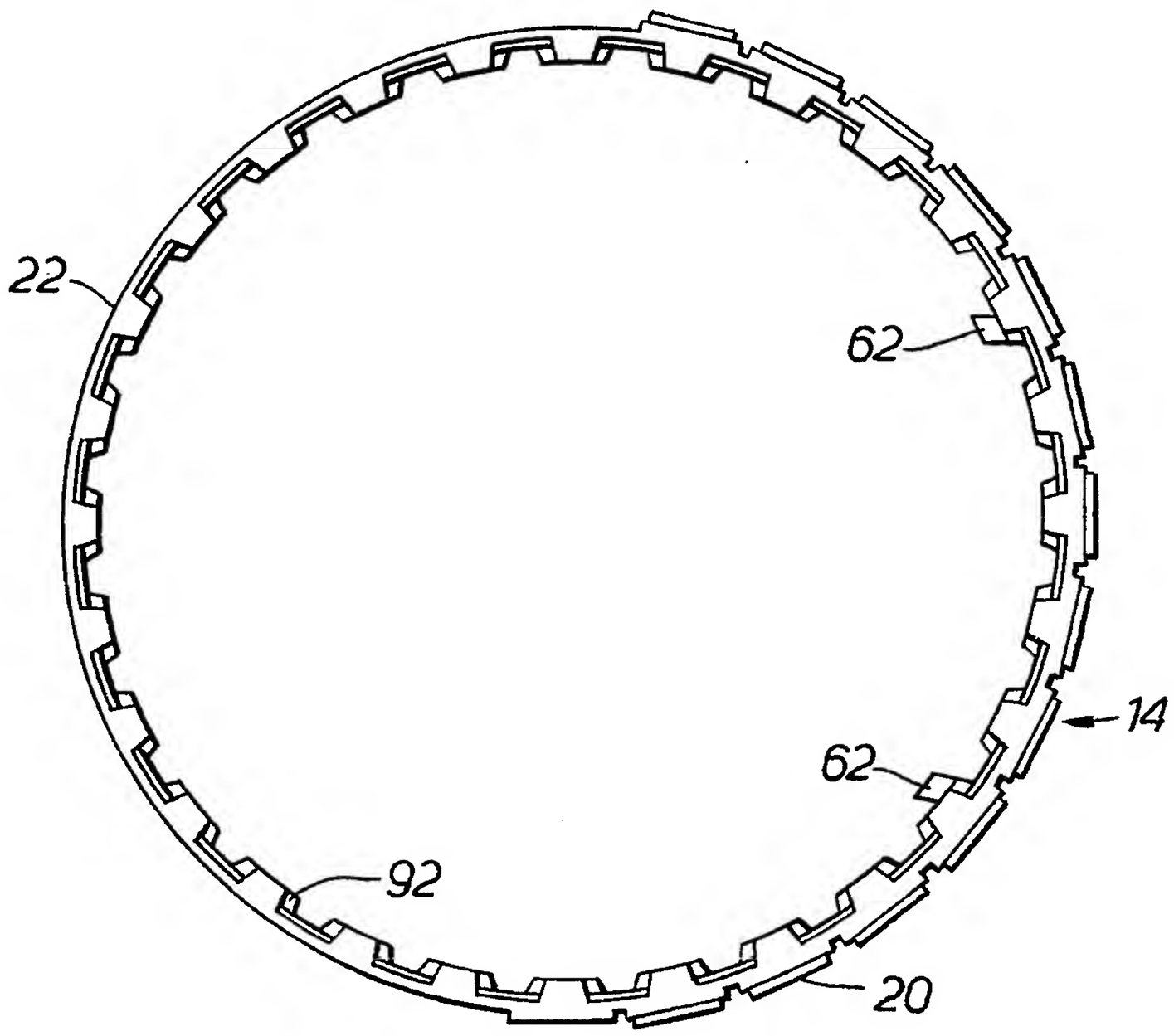
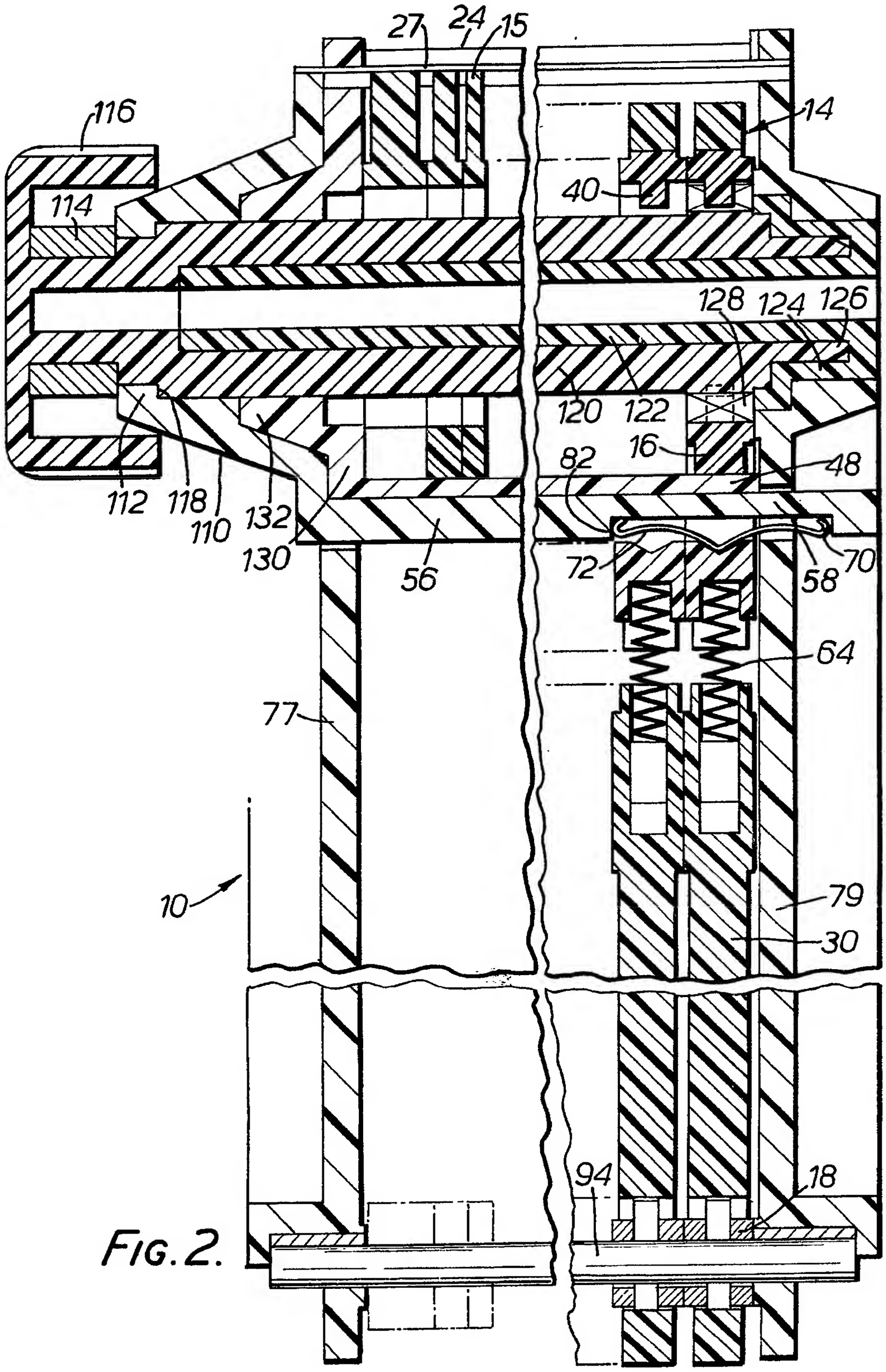


FIG. 3.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114
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58
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64
77
10
79
30
94
18

FIG. 2.

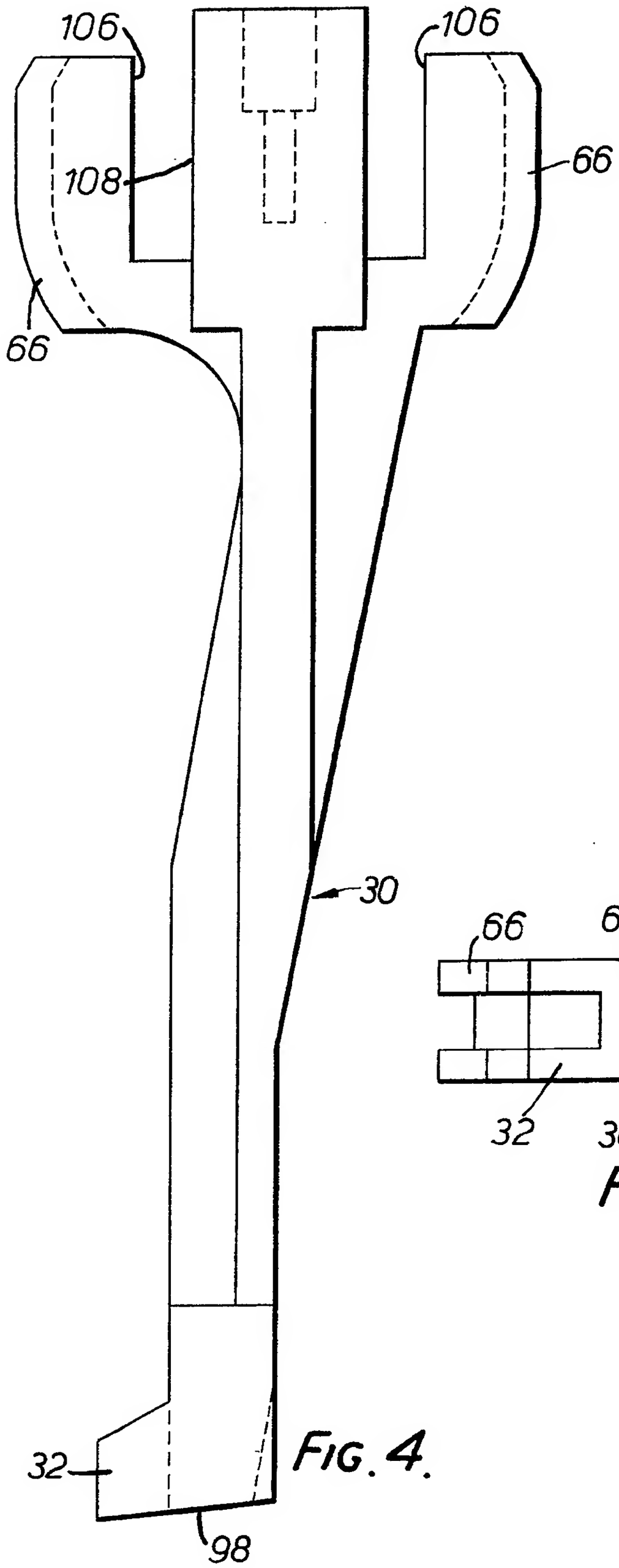

FIG. 4.

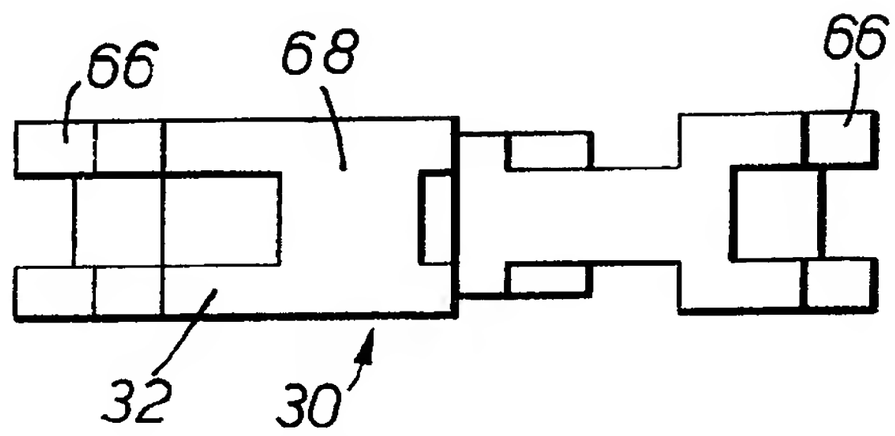

FIG. 5.

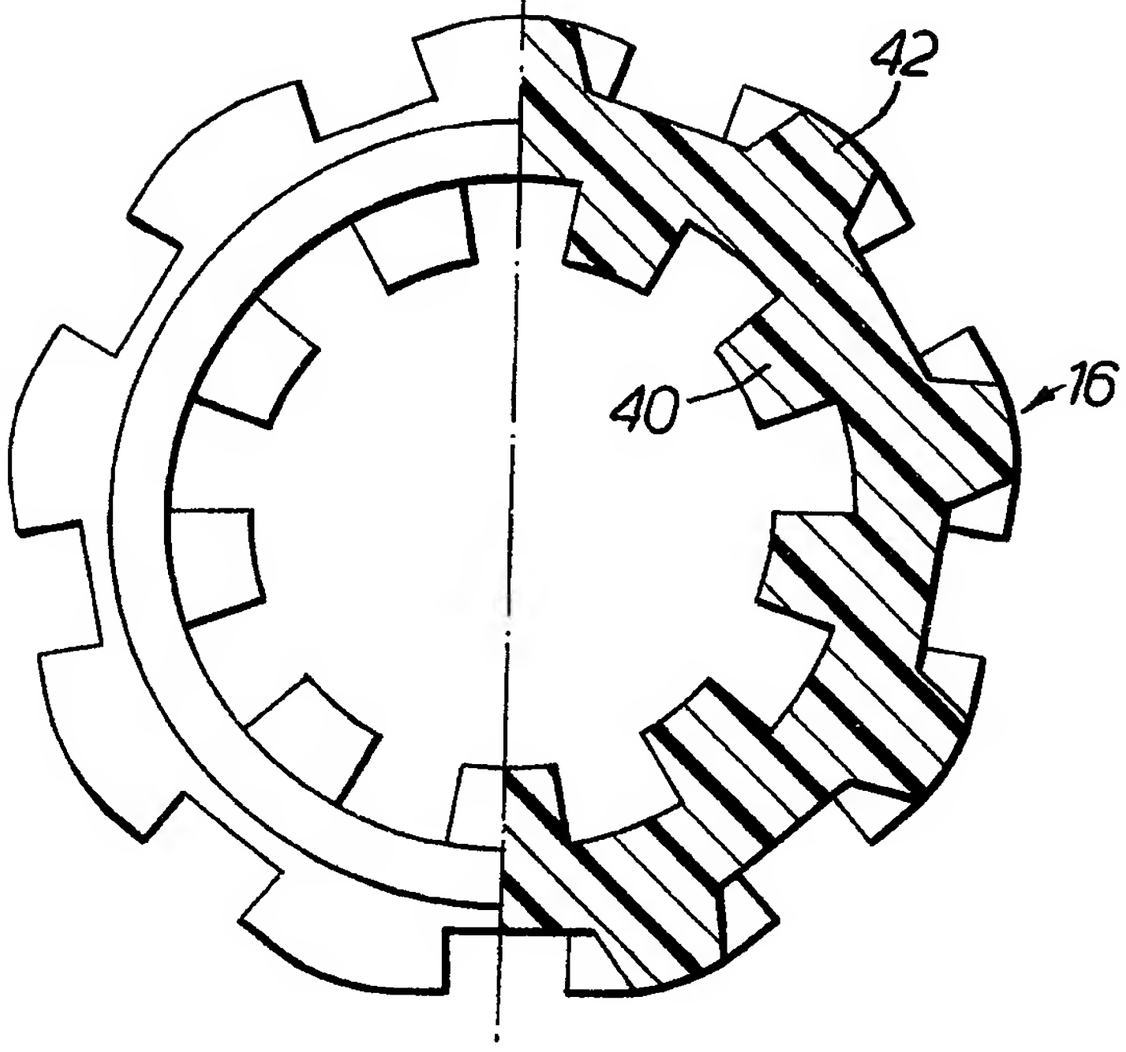

FIG. 6.

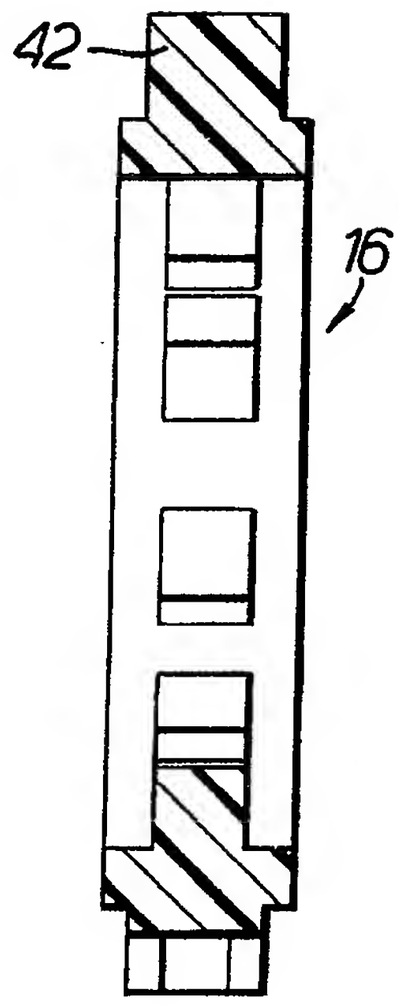

FIG. 7.

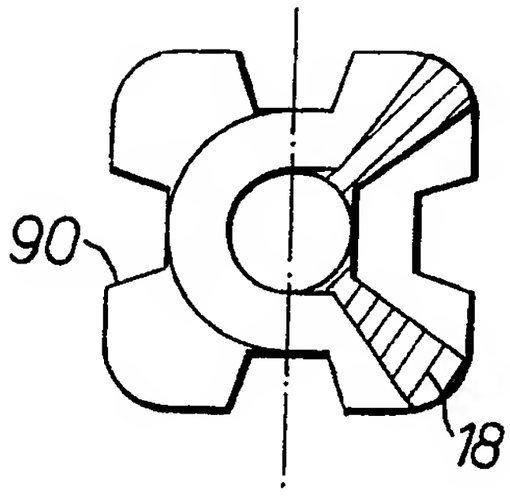

FIG. 8.

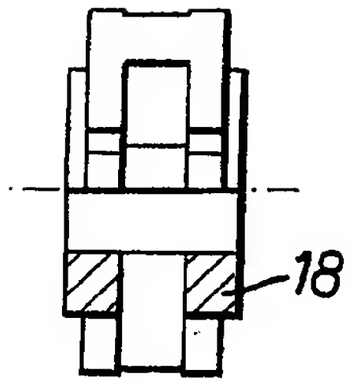

FIG. 9.

SPECIFICATION

Adjustable Facet Print Heads

This invention relates to adjustable-facet print heads.

Adjustable-facet print heads are incorporated in many devices and apparatus, for example date stamps and label applicators which are constructed to carry a reel of pressure-sensitive adhesive labels forming a web, to print these labels while still forming part of the web with specified information and to dispense the labels individually ready printed for application to an article. The most common use of such label applicators is the labelling of retail articles to give price, and sometimes stock-code information.

The quality of printing produced by these print heads is important, particularly in label applicators since poor quality is liable to cause misreading, and, in the case of retail sales, problems with stock control, with customers and with staff. It is particularly important, to achieve good print quality that at the instant of printing, the operative print facets should have the printing surfaces of the facets lying precisely in a single plane to ensure even print pressure.

It is also desirable that the print head should provide a positive read-out of the operative print facets so that an operator can read the print impression about to be formed without being required to distinguish the characters on the print facets themselves which are often hard to read owing to lack of contrast caused by the accumulation of ink, not only on the printing surfaces themselves but other parts of the print facets. To overcome this difficulty it has already been proposed to provide on each print band carrying a selection of facets, an additional set of facets which are arranged to appear at a window generally at a location remote from the operative print facets, but which correspond one for one to the print facets operative at any given time. The read-out characters are manufactured with contrasting colours between the reading surfaces and the remainder of each facet, but over a period of time in previously proposed print heads ink from the print facets has been found liable to migrate to the read-out facets with consequent loss of contrast and difficulty in reading.

The novel features of a print head embodying the invention will be readily apparent from the following description, which is given by way of example only, with reference to the accompanying diagrammatic drawings, in which:

Figures 1*a* and 1*b* are together a cross-section through a print head in accordance with the invention;

Figure 2 is a longitudinal section of the print head of Figure 1;

Figure 3 is a side elevation of one print band as incorporated in the print head of Figures 1 and 2;

Figure 4 is a side elevation of a member which serves to apply pressure resiliently to a print band;

Figure 5 is an end elevation of the member illustrated in Figure 4;

Figure 6 is part end elevation and a part section of a print band support wheel;

Figure 7 is a section through the wheel of Figure 6;

Figure 8 is a part end elevation and a part section of a print band support member serving to carry operative print facets; and

Figure 9 is a part side elevation and a part longitudinal section through the member of Figure 8.

Referring now to the drawings and in particular to Figures 1 and 2, the print head 10 comprises a casing 12, which will normally form part of a label applicator, containing a plurality of print bands 14 (see also Fig. 3), each made substantially in accordance with our copending application No. 7711760, with each band being mounted at one end on a wheel 16 (Figures 1, 6 and 7), and the other being mounted on a member 18 of generally square form when viewed in end elevation as indicated in Figures 1, 8 and 9. The print bands 10 and their associated supports are mounted side-by-side and are provided in a number sufficient to meet the requirements of the particular label applicator or other device in question.

Any space not required is taken up by packing washers 15, which are not necessarily disposed as shown in Figure 2, but may be distributed between print bands 14.

Each print band 14 carries a plurality of print facets 20 and a plurality of read-out facets 22 corresponding in number to the number of print facets. Each print band is made from a combination of a relatively soft plastics material to ensure good print quality, bonded to a relatively hard material which enables accurate location of the print band at each printing location and at the same time provide dimensional stability over a long period of use. The harder, more resistant, inner portion of each print band is important in connection with the control of the position of the print band when incorporated in the apparatus now being described.

The casing has a window 24 of elongate form to enable the read-out facets 22 corresponding to the operative print facets 20 at any given setting to be read and a part-cylindrical portion 26 carries a pivot 23 by which the print head can be swung from an operative to an inoperative position, and *vice versa*.

The window 24 is defined by the casing 12 and internally the longitudinal edges of the window are recessed to receive mouldings 26 which in turn carry rectangular section, elongate members 25, preferably of black material, which more clearly define a frame around the read-out facets 22. The print band available for adjustment is indicated by fingers 27 movable along the members 25 and integral with further parts of the head to be described hereinafter. At the end of the casing remote from the read-out window 24 there is a further window 28 through which the print facets 20, operative at any given setting, of all the

print bands protrude to enable printing to take place.

The generally square members 18 are each biased in the printing direction of the print facets operative at any given setting by a corresponding moulded plastics assembly 30 carrying a detent tooth 32 at the end thereof engaging the face of the corresponding member 18 opposite the face carrying the operative facet.

Turning now to details of the construction of the print head 10, each of the upper wheels 16 has nine internal teeth 40 and nine external teeth 42 which engage the respective print band 14 in the recesses provided beneath each read-out facet 22. The manner in which a print band 14 engages the teeth of the corresponding print wheel is illustrated in Figure 1 and the teeth and recesses are shaped to co-operate with the band teeth as described in the copending application hereinbefore referred to.

The detent action of the assembly 30 will prevent inadvertent movement of all the print bands 14 with the exception of the band specifically selected for adjustment. To avoid any possible drag effect on bands 14 adjacent to the band to be adjusted, two pairs of horns 44 are provided which engage external recesses of the wheels 16 of the said two adjacent bands 14 thus positively locking these wheels. The horns 44 form parts of a member to be described hereinafter. Each pair of horns (only one horn of each pair is visible in Figure 1) is integral with a slide base 45 having a step and these bases 45 are movable along complementary surfaces of an elongate member 48 of complex section as shown in Figure 1. The member 48 is integral with the casing as described hereinafter.

The elongate member 48 and the bases 45 are accommodated within, but do nor normally touch a row of rocker assemblies 46, only one of which is shown in Figure 1. Each rocker assembly 46 has a body 50 and two upstanding generally arcuate fingers 52 the tips 53 of which are juxtaposed to the corresponding wheel 16. The body 50 has a downwardly-facing, central recess 54 which accommodates an end portion of a compression spring 64 and an upwardly-facing, central recess 84 which accommodates parts to be described. The body 50 also has two opposed lower notches 60 which are arranged to engage stop pips 62 of the corresponding print band 14. The helical compression spring 64 is also mounted in an upper end of the assembly 30. The assembly 30 also carries two guides 66 which serve to ensure adequate guidance of the corresponding print band 14 during adjustment thereof. The guides are bifurcated as is apparent in Figure 5 and are spaced apart by an amount sufficient to receive the pips of the band 14. Each spring 64 biases the corresponding assembly 30 towards the members 18 and at the same time allows the assembly 46 to rock when required.

The slide 58 has a recess 70 which carries a leaf spring 72, one end portion of which is arranged to engage in a shallow V-shaped notch 74 in the bottom of the recess 84 of one of the assemblies 46. The fingers 52 of each assembly 46 are subject to the guidance provided by two transverse, profiled, bars 76 with an angular recess 78 and an arcuate surface 80 conforming to the periphery of the wheels 16. The bars 76 are rigid with side walls of the applicator casing 77, 79.

The side walls are held together, *inter alia*, by conventional spring clips 81, 83 and by a dowel pin 85 or other means, (not shown). The slide 58 is movable in its length direction together with the spring 72 in a complementary recess in the member 48. The leaf spring 72 is generally arcuate but has a semi-annular end portion 82 engaged in the recess 70. Lateral movement of the arcuate portion of the spring is prevented by the side walls of the recesses 84 formed in the members 46.

At the lower end (as shown) of the print head, each print band 14 engages on an individual one of the generally square members 18 having recesses 90, generally similar to those of the upper guide wheels 16 and arranged to receive internal pips 92 of the print band. These pips 92 are of hard material and will not therefore give rise to inaccurate location of the print facets 20 as would be the case if the inner portion were made of the same, relatively soft, material of the print facets. As will be apparent in Figure 1, these square members 18 are mounted on a common transverse pin 94 with a certain amount of clearance 96 and are biased by the elongate detent assembly 30 extending from and integral with the guides 66 (Figures 4 and 5) so that the clearance is as shown, in exaggerated form, in Figure 1.

An abutment surface 98 of the end 32 of the member 30 engages against the opposite face of the corresponding square member to that carrying the operative print facet at any given adjustment setting, and the spring action provided by the spring 64 enables indexing of the square member from one operative print facet to the next adjacent operative print facet. The end 32 of the detent assembly 30 is enlarged so that it engages a substantial proportion of the opposed face of the square member and as will be apparent from Figure 1 the centre of the surface 38 is approximately coincident with the centre of the corresponding surface of the square member 18.

Each member 30 is itself guided along a substantial proportion of its length by transverse plate-like members 100, 102 which also act, on their outwardly directed faces as guides for the print bands 14. Further guidance for each assembly 30 is provided by two transverse bars 104 engaged in respective recesses 106 in the upper end (as shown in Figure 1) of the member. The recesses provide for clearance both laterally and in the vertical sense of the bars, but the clearance is small in relation to a central, hollow spigot 108 which receives the lower end of the corresponding spring 64.

The slide member 58 is integral with an elongate member 56 which is integral at one end with a generally annular part 110 with a conical outer surface having an internal, annular, projection 112 engaged between a ring 114 integral with a knob 116 and a shoulder 118 of an elongate tubular member 120 fast for rotation with the knob 116.

The annular part 110 carries at its upper periphery (as shown) the indicator 27 and the slide 58 carries the bases 45 of the pairs of horns 44. The whole of this assembly will be an integral plastics moulding. The ring 114 and shoulder 118 do not constrain the part 110 to rotate with them but act to transmit longitudinal motion. The tubular member 120 is rotatably supported along substantially its whole length by an internal tubular member 122 supported at its right-hand end by the end wall 79 of the applicator casing. The end portion of the elongate tubular member 122 is in the form of an integral ring 124 surrounding the end portion itself and the annular recess formed thereby accommodates an end portion 126 of the member 120.

This construction enables longitudinal movement of the knob 116, the slide member 58, the tubular member 120 and the ring 114 relative to the end wall 79 of the casing. The knob 116 and the member 120 can also be rotated and such rotary movement enables a selected one of the wheels 16 to be rotated by interengagement between a ring of external teeth 128 and the internal teeth 40 of the selected wheel.

The profiled member 48 supporting the horns 44 is integral with an annular flange 130 with a thickened annular base 132 and this base acts as a bearing for the tubular member 120 when the latter is rotated.

Selection of the given print band for adjustment is effected by the knob 116 carrying the slide member 58, the end of which remote from the knob carries the leaf spring 72 arranged to engage in the notch 74 of a selected one of the rocker assemblies 46 whereby adjustment can take place of the corresponding print band 14. The spring 72 acts as a longitudinal detent and its position located in the assembly 46 of the selected band results in movement to the corresponding read-out facet 22 by the indicators 27. The horns 44 positively prevent any rotation of both adjacent wheels. By withdrawing the knob 116 axially to the left from the position illustrated in Figure 2, it is possible to select any one of the print bands 14 for adjustment. Once a given print band has been selected for adjustment, rotation of the knob 116 acts to turn the corresponding upper support wheel 16 through the agency of the tubular member 120 thereby indexing the band to a new position which can be readily determined by the appearance of the new character on the read-out facets 22 in the opening or window 24 at the upper end of the casing.

Each print band carries the two stop pips 62 having a form which positively limits driving of the print band in both senses by engaging corresponding ones of the notches 60 provided in the lower portion of the corresponding body 50. These stop pips 62 ensure that there is no possibility of the print band being adjusted sufficiently far for the read-out facets 22 to reach the portion of the print head which normally encloses the print facets 20. As will be appreciated it is desirable to do this both to avoid the print facets appearing at the read-out window when they cannot readily be read and, more importantly, to stop any possibility of ink making contact with the upper, support, wheel 16 thereby encouraging accumulation of partially dried ink and risking application of ink to the read-out facets, thereby spoiling legibility. The lower pip 62 (as shown) prevents clockwise rotation at a pre-determined limit and the upper pip, as shown in Figure 1, prevents anti-clockwise rotation.

In operation it will be found that the given setting of each print band 14 provides an exact read-out corresponding to the read-out characters at the window 24 at the upper end of the device. If it is desired to adjust one of the print bands 14 to give a different read-out and print-out, the knob 116 is traversed axially until the corresponding rocker assembly 46 of the print band in question is engaged by the spring 72, and since a strong click action is present, the operator will readily appreciate when a required print band has been selected for adjustment with the aid of the indicator 27. The rotation of the knob 116 will then effect through the tubular member 120 and its teeth 128 and the teeth 40 of the selected print wheel, a change in the operative print facet of the print band 14. It is inevitable that the required print facet will be available between the two stops 62 on each of the print bands 14 and so there is no need to rotate the support wheel beyond that limit. However, to ensure that there is no risk of contamination by ink of parts of the device which are normally engaged by the read-out facets 22, the stop pip 62 comes into operation as indicated in Figure 1 or alternatively the other stop pip can engage the corresponding notch 60 of the rocker assembly 46 when the print band has been adjusted to the limit in the opposite sense. While the adjustment is taking place, the end surface 98 of detent member 30 slides over the corresponding generally square section member 18, and, when the desired print facet has been reached, as indicated by the corresponding read-out facet, further rotation is interrupted and the square member and its corresponding print band is urged downwardly by the spring. The precise location of the square wheel and the fully engaged pip of the corresponding print facet will hold the band precisely in the required location so that the plane of the new print facet working surface is in the same plane as all the other print facets currently in the operative positions. Any attempt by an operator to force the print band beyond the limit position is strongly resisted because the rocker assembly 46 will be subject to a tilting action with

correspondingly reinforced engagement of the horns 44 of the members carried by the profiled member 48 of the rocker assembly 46. Exactly the same remarks apply when the other stop pip 62 engages the other notch 60 of the rocker assembly. The engagement of either pip 62 in the corresponding notch 60 has the effect of rocking the assembly 46.

It will be noted that the slide member 58 engages with the spring 72 a notch at the centre of each rocker assembly and not as in the previous proposals at a position corresponding to an edge of a support wheel. This construction is of value, if, as is often the case, the print bands do not have the same width.

Overall, the hereinbefore described print head has one or more of the following advantages:

1. Even an inexperienced or clumsy operator is able to adjust print facets operative at any given time so that printing surfaces of each facet lie very accurately in the same plane. Any very small angular variation is unimportant because the use of the print band in accordance with application 7711760 with relatively soft facet material accommodates the variation without materially affecting the print quality.

2. The possibility of inadvertently adjusting the print band other than the one selected is totally impossible since the adjacent non-selected print bands are positively locked in the selected positions by the horns 44.

3. The selection of detent action of the centre of each rocker assembly avoids problems associated with different widths of print band which may be incorporated in any given head.

4. The possibility of read-out facets becoming inked, thus losing their contrast is substantially eliminated.

5. The path length of each print band is symmetrical about the centre line despite the conventional off-set of the print bands in relation to the centre line.

6. The print bands employed have internal locating pips of relatively hard material and furthermore the pips are disposed centrally with respect to the edges of the band so that both longitudinally and transversely very precise location of the print facets operative at any given setting can be achieved.

7. The springs 64 provide a degree of resilient support for the print facets operative at any given setting so that any slight unevenness in a particular print facet can be accommodated.

8. The provision of support wheels for each band which engage only the centre pips of the bands enables a good clearance between adjacent bands so that no shims are necessary which are often prime causes of ink accumulation and transfer. Because of the rigidity of the pips lateral movement and contact between adjacent bands is eliminated.

9. The spindle 94 serves to locate the print facets operative at any given setting collectively, whereas the clearance 96 between that shaft and the square members 18 provides for individual adjustment automatically.

10. When the knob 116 and associated parts are fully home, (as shown in Fig. 2) all the print bands are locked except the one of which the wheel 16 lies opposite the operative end of the spring 72.

11. The detent action of the members 30 is powerful and the risk of a print facet operative at any given setting being misaligned is substantially eliminated.

12. Although the locating pips of the print bands do not extend across the full width of the bands, the stop pips 62 may extend across the full width and thus provide greater strength to resist breakage by an overstrong operator.

13. The overall construction is such that no opportunity is given for the ink of the print facets to accumulate on any accessible surface of the device.

14. The print band lengths are the same either side of the centre-line despite the provision of band paths which are asymmetrical with respect to the centre line joining the axis of rotation of the upper support wheels 16 and the square members 18. This is achieved by a construction in which there are slight angular changes in the path on both sides of the centre line. (See Fig. 1)

15. Bands cannot be rotated so that read-out sections move into the printing zone or vice-versa, thus saving annoyance, time and ink contamination. This is ensured by master pips and force amplifying assemblies 46.

Claims

1. An adjustable facet printing device comprising a frame, a plurality of print bands arranged side-by-side on two sets of toothed co-axial support wheels rotatable in the frame, the wheels of one set providing a resilient support for the respective operative print facets of the bands whereby the operative print facets will produce a good print impression irrespective of precise co-incidence of the working surfaces of all the operative facets in the same plane, means for adjusting the facets of the print bands operative at any setting and means for locking print bands adjacent a print band being adjusted.

2. A device according to claim 1 wherein the print bands are each made with a relatively harder material engaging the support wheels and a relatively softer material defining the print facets.

3. A device according to claim 1 or claim 2, wherein the wheels supporting the operative facets are of square shape, each face having a recess to accommodate a pip of an associated print facet.

4. A device according to any one of claims 1 to 3 wherein the set of support wheels remote from the operative print facets has external recesses to accommodate pips of the print bands and internal teeth engageable with a toothed adjustment member forming a part of the adjustment means.

5. A device according to any one of the preceding claims wherein each support wheel carrying an operative facet of the corresponding

print band is resiliently biased by an elongate member loaded by a spring co-operating with the said locking means.

6. A device according to claim 4 wherein the locking means comprises two pairs of locking means, one pair being engageable in recesses of adjacent support wheels on either side of a support wheel selected for adjustment.

7. A device according to claim 6 wherein the print bands each exclude print facets and read-out facets and these forms of facets are divided by locking pips, the locking means including detents engageable by said locking pips to prevent the read-out facets reaching an adjusted position appropriate to a print facet.

8. A device according to any one of the preceding claims wherein the wheels supporting operative print facets like side-by-side without intermediate spacers.

9. A device according to any one of the preceding claims comprising means acting to lock all the print bands other than that selected for adjustment.

10. A device according to claim 7 wherein the locking pips extend across the full width of each band.

11. An adjustable facet printing device comprising a frame, a plurality of print bands arranged side by side on a first set of toothed co-axial wheels adapted to support print facets operative at any given setting and a second set of toothed wheels remote from the first set, means for selectively adjusting the operative facet of one said print band and means positively locking the second wheels of print bands adjacent the second wheel selected for adjustment of the corresponding print band.

12. An adjustable facet printing device substantially as hereinbefore described with reference to the accompanying drawings.

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